WE CLAIM:

1. A hydrogen purification device, comprising:

an enclosure having an internal compartment in which at least one hydrogen-selective membrane is supported and adapted to receive under a pressure a mixed gas stream containing hydrogen gas and other gases, wherein the at least one hydrogen-selective membrane is adapted to separate the mixed gas stream into at least one hydrogen-rich stream that is formed from a portion of the mixed gas stream that passes through the at least one hydrogen-selective membrane and at least one byproduct stream that is formed from a portion of the mixed gas stream that does not pass through the at least one hydrogen-selective membrane, wherein the at least one hydrogen-rich stream contains hydrogen having a greater purity than the mixed gas stream, and further wherein the at least one hydrogen-selective membrane is at least substantially comprised of a primary component that includes palladium and silver and a secondary component consisting of approximately 5-250 ppm carbon.

2. The hydrogen purification device of claim 1, wherein the secondary component contains carbon in the range of approximately 5 to approximately 150 ppm.

3. The hydrogen purification device of claim 2, wherein the secondary component contains carbon in the range of approximately 5 to approximately 100 ppm.

4. The hydrogen purification device of claim 2, wherein the secondary component contains carbon in the range of approximately 10 to approximately 50 ppm.

5. The hydrogen purification device of claim 2, wherein the primary component includes an alloy of palladium and silver.

6. The hydrogen purification device of claim 5, wherein the primary component includes an alloy containing palladium and approximately 35-45 wt% silver.

7. The hydrogen purification device of claim 5, wherein the primary component includes an alloy containing palladium and approximately 25 wt% silver.

8. The hydrogen purification device of claim 1, wherein the membrane further comprises approximately 5-50 ppm silicon.

9. The hydrogen purification device of claim 1, wherein the membrane further comprises approximately 5-100 ppm oxygen.

10. The hydrogen purification device of claim 1, wherein the primary component includes an alloy containing palladium and silver.

11. The hydrogen purification device of claim 10, wherein the primary component includes an alloy containing palladium and approximately 35-45 wt% silver.

12. The hydrogen purification device of claim 10, wherein the primary component includes an alloy containing palladium and approximately 25 wt% silver.

13. The device of claim 1, wherein the at least one hydrogen-selective membrane is at least substantially comprised of an alloy comprising the primary and the secondary components.

14. The device of claim 13, wherein the alloy further comprises at least one component in addition to the primary and the secondary components.

15. The device of claim 1, wherein the at least one hydrogen-selective membrane has a generally tubular configuration.

16. The device of claim 1, wherein the at least one hydrogen-selective membrane has a generally planar configuration.

17. The device of claim 1, wherein the at least one hydrogen-selective membrane is mounted on a frame that is housed within the enclosure.

18. The device of claim 17, wherein the at least one hydrogen-selective membrane is mounted on a frame that forms at least a portion of the enclosure.

19. The device of claim 1, wherein the device includes at least one membrane envelope formed from a pair of the hydrogen-selective membranes, wherein each of the pair of the membranes includes a first surface oriented to be contacted by the mixed gas stream and a permeate surface that is opposed to the first surface, wherein the pair of the membranes are oriented such that the pair of hydrogen-selective membranes are spaced-apart from each other with their permeate surfaces generally facing each other to define a harvesting conduit extending therebetween, and further wherein the at least one hydrogen-rich stream includes at least a portion of the mixed gas stream that passes through the membranes to the harvesting conduit, with the at least one byproduct stream including at least a portion of the mixed gas stream that does not enter the harvesting conduit.

20. The device of claim 19, wherein the at least one membrane envelope includes a support within the harvesting conduit and adapted to support the pair of hydrogen-selective membranes, wherein the support includes a pair of generally opposed surfaces which are adapted to provide support to a respective one of the permeate surfaces of the pair of hydrogen-selective membranes.

21. The device of claim 20, wherein the support engages but is not bonded to the pair of hydrogen-selective membranes.

22. The device of claim 20, wherein the support is formed from a porous material.

23. The device of claim 20, wherein the support is adapted to permit flow of gas both parallel and transverse to the permeate surfaces of the membranes.

24. The device of claim 20, wherein the pair of hydrogen-selective membranes are adhesively bonded to the support.

25. The device of claim 19, wherein the hydrogen purification device includes a plurality of gas transport conduits interconnecting the at least one membrane envelope to selectively deliver the mixed gas stream to the first surfaces of the membranes, remove the hydrogen-rich stream from the harvesting conduit, and remove the byproduct stream.

26. The device of claim 19, wherein the hydrogen purification device includes a plurality of membrane envelopes.

27. The device of claim 1, in combination with a fuel cell stack adapted to receive at least a portion of the hydrogen-rich stream.

28. The device of claim 27, in combination with a fuel processor adapted to produce the mixed gas stream.

29. The device of claim 28, wherein the fuel processor includes at least one reforming catalyst bed and is adapted to produce the mixed gas stream by steam reforming.

30. The device of claim 29, in further combination with a fuel cell stack adapted to receive at least a portion of the hydrogen-rich stream and to produce an electric current therefrom.

31. The device of claim 30, in further combination with at least one electrical energy-consuming device adapted to draw at least a portion of the electric current produced by the fuel cell stack.

32. In a hydrogen purification device that is adapted to be operated at a temperature of at least 200° C and a pressure of at least 50 psi and which includes an enclosure with an internal, at least substantially fluid-tight compartment having at least one inlet, at least one outlet, and containing at least one hydrogen-selective metal membrane adapted to separate a mixed gas stream containing hydrogen gas and other gases into a hydrogen-rich stream containing at least substantially hydrogen gas and a byproduct stream containing at least a substantial portion of the other gases, the improvement comprising: the membrane being at least substantially comprised of an alloy of palladium, silver and carbon, with the carbon being present in the alloy in the range of approximately 5-250 ppm.

33. The device of claim 32, wherein the alloy comprises approximately 5-150 ppm carbon.

34. The device of claim 32, wherein the alloy comprises approximately 5-100 ppm carbon.

35. The device of claim 32, wherein the alloy comprises approximately 10-50 ppm carbon.

36. The device of claim 32, wherein the alloy comprises approximately 25 wt% silver.

37. The device of claim 32, wherein the alloy comprises approximately 35-45 wt% silver.

38. The device of claim 32, wherein the alloy includes at least one additional component other than palladium, silver and carbon.

39. The device of claim 32, wherein the membrane includes at least one component in addition to the alloy.

40. The device of claim 32, in combination with a fuel processor that is adapted to produce the mixed gas stream.

41. The device of claim 40, in further combination with a fuel cell stack adapted to receive at least a portion of the hydrogen-rich stream.

42. The device of claim 32, wherein the membrane includes an etched region and an unetched region, and further wherein the etched region of the membrane has a thickness that is less than the thickness of the membrane in the unetched region.

43. The device of claim 42, wherein the thickness of the etched region is less than 20 microns.

44. The device of claim 42, wherein the thickness of the etched region is less than 15 microns.

45. The device of claim 42, wherein the etched region has a thickness that is less than approximately 80% of the thickness of the unetched region.

46. The device of claim 45, wherein the etched region has a thickness that is between approximately 40% and approximately 70% of the thickness of the unetched region.

47. A fuel processing system, comprising:

means for producing a mixed gas stream containing hydrogen gas and other gases;

means for receiving under pressure the mixed gas stream;

means for separating the mixed gas stream into at least one hydrogen-rich stream containing hydrogen gas having a greater hydrogen purity than the mixed gas stream and at least one byproduct stream containing at least a substantial portion of the other gases, wherein the means for separating includes at least one hydrogen-selective membrane that is at least substantially comprised of a primary component that consists essentially of palladium and silver and a secondary component consisting of approximately 5-250 ppm carbon.

48. The system of claim 47, wherein the primary component includes an alloy containing palladium and approximately 25 wt% silver.

49. The system of claim 47, wherein the primary component includes an alloy containing palladium and approximately 35-45 wt% silver.

50. The system of claim 47, wherein the secondary component comprises carbon in the range of approximately 5 to 150 ppm.

51. The system of claim 50, wherein the secondary component comprises carbon in the range of approximately 10 to 50 ppm.

52. The system of claim 47, wherein the at least one hydrogen-selective membrane is at least substantially comprised of an alloy comprising the primary and the secondary components.

53. The system of claim 47, wherein the at least one hydrogen-selective membrane further includes at least one component other than the primary and the secondary components.

54. The system of claim 47, further including means for generating an electric current from at least a portion of the at least one hydrogen-rich stream.

55. A fuel processor, comprising:

a hydrogen-producing region adapted to receive a feed stream and to produce a mixed gas stream containing hydrogen gas and other gases therefrom;

a separation region adapted to receive the mixed gas stream and to produce a hydrogen-rich stream containing at least substantially hydrogen gas and a byproduct stream containing at least a substantial portion of the other gases, wherein the separation region includes at least one hydrogen-selective metal membrane, with the hydrogen-rich stream being formed from a portion of the mixed gas stream that passes through the membrane and the byproduct stream being formed from a portion of the mixed gas stream that does not pass through the membrane, wherein the membrane is at least substantially comprised of palladium, silver and 5-250 ppm carbon.

56. The fuel processor of claim 55, wherein the membrane contains carbon in the range of approximately 5 to approximately 150 ppm.

57. The fuel processor of claim 56, wherein the membrane contains carbon in the range of approximately 10 to approximately 100 ppm.

58. The fuel processor of claim 56, wherein the membrane contains carbon in the range of approximately 5 to approximately 50 ppm.

59. The fuel processor of claim 58, wherein the membrane includes an alloy containing palladium and approximately 25 wt% silver.

60. The fuel processor of claim 55, wherein the membrane further comprises approximately 5-50 ppm silicon.

61. The fuel processor of claim 55, wherein the membrane further comprises approximately 5-100 ppm oxygen.

62. The fuel processor of claim 55, wherein the membrane includes an alloy containing palladium and silver.

63. The fuel processor of claim 55, wherein the hydrogen-producing region includes a reforming region that contains a reforming catalyst and is adapted to receive the feed stream and produce the mixed gas stream therefrom.

64. The fuel processor of claim 63, wherein the fuel processor further includes a second reforming region containing a reforming catalyst downstream from the separation region and adapted to receive the hydrogen-rich stream.

65. The fuel processor of claim 63, wherein the fuel processor further includes a polishing region containing a methanation catalyst downstream from the separation region and adapted to receive the hydrogen-rich stream.

66. The fuel processor of claim 55, wherein the feed stream contains water and the hydrogen-producing region is adapted to produce the mixed gas stream by electrolysis.

67. The fuel processor of claim 55, wherein the feed stream contains a carbon-containing feedstock and the hydrogen-producing region is adapted to produce the mixed gas stream by partial oxidation.

68. The fuel processor of claim 55, wherein the feed stream contains a carbon-containing feedstock and the hydrogen-producing region is adapted to produce the mixed gas stream by pyrolysis.

69. The fuel processor of claim 55, in combination with a fuel cell stack adapted to receive at least a portion of the hydrogen-rich stream and to produce an electric current therefrom.

70. The fuel processor of claim 55, wherein the separation region includes a membrane module adapted to receive the mixed gas stream and divide the mixed gas stream into the byproduct stream and the hydrogen-rich stream, the membrane module comprising:

a plurality of hydrogen-selective membranes, each having a mixed gas side and a permeate side, wherein the membranes are spaced-apart from each other and oriented with their permeate sides generally facing each other to define a harvesting conduit extending therebetween, and further wherein the hydrogen-rich stream is formed from the portion of the mixed gas stream that passes through the membranes to the harvesting conduit, with the remaining portion of the mixed gas stream which remains on the mixed gas side of the membranes forming the byproduct stream;

a support within the harvesting conduit adapted to support the membranes, wherein the support includes a pair of generally opposed surfaces which are adapted to provide support to a respective one of the permeate sides of the membranes; and

a product outlet port in fluid communication with the harvesting conduit and through which the hydrogen-rich stream is withdrawn from the membrane module.